HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

DRAFT

Hatchery Program	Fish First Spring Chinook Echo Cove Net Pens (Lewis Hatchery Transfer)
Species or Hatchery Stock	Chinook Salmon *(Oncorhynchus tshawytscha)*
Agency/Operator	Washington Department of Fish and Wildlife
Watershed and Region	Lewis Subbasin/Lower Columbia Province
Date Submitted	nya
Date Last Updated	August 15, 2004

Section 1: General Program Description

1.1 Name of hatchery or program.

Lewis River Spring Chinook- Echo Cove Net Pens

1.2 Species and population (or stock) under propagation, and ESA status.

Chinook Salmon (Oncorhynchus tshawytscha)

ESA Status: Threatened

1.3 Responsible organization and individuals.

Name (and title):	Eric Kinne
	Lower Columbia River Complex Manager
Agency or Tribe:	Washington Department of Fish and Wildlife
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Co-operators	Role
National Marine Fisheries Service	Manager of Mitchell Act Funds
Fish First 4311 Northeast 26 Court, Vancouver, Washington 98663 Contact Person: John DiVittorio Ariel, Washington 98603	Non-Profit Fish Rearing and Salmon Recovery Partners .

1.4 Funding source, staffing level, and annual hatchery program operational costs.

Funding Sources
Mitchell Act
Fish First (Non-Profit 501c) In-kind Contributions

Operational Information	Number
Full time equivalent staff	5.6
Annual operating cost (dollars)	$838,771

The costs above are associated with the Lewis River Hatchery and Speelyai Hatchery programs and cannot be broken down to specific costs for the 150,000 spring Chinook program at Echo Bay Net Pens.

1.5 Location(s) of hatchery and associated facilities.

Broodstock source	Lewis River Hatchery Spring Chinook
Broodstock collection location (stream, RKm, subbasin)	Lewis River Hatchery Trap/North Fork Lewis River/RKm 20.9/Lewis Subbasin; and Merwin Trap/North Fork Lewis River/RKm 25.8/Lewis Subbasin
Adult holding location (stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin
Spawning location (stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin
Incubation location (facility name, stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin
Rearing location (facility name, stream, RKm, subbasin)	Speelyai Hatchery/North Fork Lewis River/RKm 45.1/Lewis Subbasin; Lewis River Hatchery Trap/North Fork Lewis River/RKm 20.9/Lewis; and Echo Cove Net Pens//North Fork Lewis River/RKm 16.1/Lewis Subbasin

1.6 Type of program.

Isolated Harvest Program

1.7 Purpose (Goal) of program.

- Release 150,000 spring chinook smolts at 10 FPP into the Lewis River.
- The purpose of this isolated program is to provide adult harvest under the selective fishery regulations (retention of adipose clipped fish only) and can provide some escapement to Lewis River for broodstock hatchery production.
- Operate hatcheries consistent with the recovery of spring chinook salmon in the Lewis River. The major hatchery issues are: 1) to maintain the genetic diversity of spring chinook in the Lewis River, and ensure the reproductive success of wild spring chinook meets or exceeds recovery goals, 2) minimize the ecological interactions of hatchery spring chinook on naturally produced salmon and steelhead, and minimize the mortality of naturally produced juvenile and adult salmon and steelhead due to facility operations.

1.8 Justification for the program.

- The spring Chinook production at the Echo Bay Net Pens is a joint venture by WDFW and Fish First Co-op which unites local people, area sportsman and woman, business and government in restoring natural gamefish and their habitats in the Lewis River system.
- As a 501(c)3 non-profit organization that began on June 22, 1995, Fish First maintains a coalition of land owners, big business, small business, government groups, fishers, fish enhancement groups, commercial fisherman, sports fisherman and other interested parties to bring back selected streams and ecosystems to their fullest potential possible for current and future generations. This is being done by targeting Federal, State, and local programs that match donated funds; targeting projects that augment existing Federal, State and local programs; and enhancing habitat through education and hands-on improvement and reclamation programs. Since 1995, Fish First has been involved in the day to day operation of the Echo Bay Net Pen spring chinook program. This is an important part of the goal in order to provide selected harvest fisheries vital to the Lewis River.

- WDFW protects listed fish and provides harvest opportunity on Lewis River spring chinook through the Fish Management and Evaluation Plan (FMEP). The objectives of the WDFW's FMEP are based on the WDFW Wild Salmonid Policy. In that policy, it states that harvest rates will be managed so that 1) spawner abundance levels abundantly utilize available habitat, 2) ensure that the number and distribution of locally adapted spawning populations will not decrease, 3) genetic diversity within populations is maintained or increased, 4) natural ecosystem processes are maintained or restored, and 5) sustainable surplus production above levels needed for abundant utilization of habitat, local adaptation, genetic diversity, and ecosystem processes will be managed to support fishing opportunities (WDFW 1997). In addition, fisheries will be managed to insure adult size, timing, distribution of migration and spawning populations, and age-at-maturity are the same between fished and unfished populations. By following this policy, fisheries' impacts to listed steelhead, chinook salmon, and chum salmon in the Lower Columbia River (LCR) Evolutionary Significant Unit (ESU) will be managed to promote the recovery of these species and not at rates that jeopardize their survival or recovery. In order to minimize impact on listed fish by WDFW facilities operation and the Lewis River spring chinook program, the following Risk Aversion are included in this HGMP:

Table 1. Summary of risk aversion measures for the Echo Bay Net Pen spring chinook program.

Potential Hazard	**HGMP Reference**	**Risk Aversion Measures**
Water Withdrawal	4.2	The Echo Bay Net Pen Facility has the following permits for operation: SEPA checklist and Determination of Non-Significance (DNS) Aquatics Resources Use Authorization No. 20-071210 Cowlitz County Shoreline Substantial Development Permit WDFW Hydraulic Project Permit The Net Pen Facility meets the exemption guidelines not requiring the following permits: "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month). Army Corps of Engineers 404 Permit DOE 401 Water Quality Permit
Intake Screening	4.2	
Effluent Discharge	4.2	
Broodstock Collection & Adult Passage	7.9	Not applicable, See Lewis River Spring Chinook HGMP.
Disease Transmission	7.9, 10.11	*Fish Health Policy in the Columbia Basin*. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).
Competition & Predation	See also 2.2.3, 10.11	Current risk aversions and future considerations are being reviewed and evaluated for further minimizing impacts to listed fish.

1.9 List of program "Performance Standards".

See section 1.10 below.

1.10 List of program "Performance Indicators", designated by "benefits" and "risks".

1.10.1 Benefits:

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Assure that hatchery operations support Columbia River fish Mgt. Plan *(US v Oregon)*, production and harvest objectives	Contribute to a meaningful harvest for sport, tribal and commercial fisheries. Achieve a 10-year average of 0.35 % smolt-to-adult survival (range 0.04-0.68%) that includes harvest plus escapement (525 fish at current production levels).	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of broodstock need.
Maintain outreach to enhance public understanding, participation and support of Washington Department of Fish & Wildlife (WDFW) hatchery programs	Provide information about agency programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts may include festivals, classroom participation, stream adoptions and fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program. Record on-station organized education and outreach events.
Region-wide, groups are marked in a manner consistent with information needs and protocols to estimate impacts to natural and hatchery origin fish	Use mass-mark (adipose-fin clip) for selective fisheries with additional groups Ad+CWT and CWT only for evaluation purposes	Returning fish are sampled throughout their return for length, sex, and mark.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow Co-managers Fish Health Disease Policy (1998).	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspect adult broodstock yearly for pathogens and parasites and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for parasites and pathogens.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy.
	Inspection of adult broodstock for pathogens.	At spawning, lots of 60 adult broodstock are examined for pathogens
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens.	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.

1.10.1 Risks:

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
Minimize impacts and/or interactions to ESA listed fish	Hatchery operations comply with all state and federal regulations. Hatchery juveniles are raised to smolt-size (10 fish/lb) and released from the hatchery at a time that fosters rapid migration downstream. Mass mark production fish to identify them from naturally produced fish (except CWT only groups)	As identified in the HGMP: Monitor size, number, date of release and mass mark quality. Additional WDFW projects: straying, instream evaluations of juvenile and adult behaviors, NOR/HOR ratio on the spawning grounds, fish health documented.
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards and protocols including IHOT, Co-managers Fish Health Policy and drug usage mandates from the Federal Food and Drug Administration	Hatchery goal is to prevent the introduction, amplification or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of this facility.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
Ensure hatchery operations comply with state and federal water quality and quantity standards through proper environmental monitoring	NPDES permit compliance WDFW water right permit compliance	Flow and discharge reported in monthly NPDES reports.
Water withdrawals and instream water diversion structures for hatchery facility will not affect spawning behavior of natural populations or impact juveniles.	Hatchery intake structures meet state and federal guidelines where located in fish bearing streams.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
Hatchery operations comply with ESA responsibilities	WDFW completes an HGMP and is issued a federal and state permit when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvests are monitored by agencies and tribes to provide up to date information.

1.11.1 Proposed annual broodstock collection level (maximum number of adult fish).

See Lewis River Spring Chinook HGMP.

1.11.2 Proposed annual fish release levels (maximum number) by life stage and location.

Fish are transferred from Speelyai Hatchery to Echo Cove net pens in two groups. The first group arrives in December (75,000 fish at approximately 12 fpp). These fish are reared for approximately a month and a half, and released in early February. A second group is transferred in after the first group is released in early February (75,000 at approximately 10 fpp) for rearing/acclimation and volitional release from March 1-31.

Age Class	Max. No.	Size (ffp)	Release Date	Location			
				Stream	Release Point (RKm)	Major Water-shed	Eco-province
Yearling	150000 FBD	10	February/ March	N.F.Lewis	16.1	Lewis River	Kalama/Lewis

1.12 Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Data source: WDFW Hatchery data records: WDFW Stock Assessment Report; RMIS data reports; Annual Coded-Wire Tag Program, Washington Missing Production Groups.

Brood Year	Smolt to Adult Survival (%)	Total Catch (all ages)	Spawning Ground Escapement	Hatchery Escapement
1995	0.04	45	0	18
1996	0.46	456	168	216
1997	0.25	308	48	84
1998	0.68	798	0	225
1999	nya			

1.13 Date program started (years in operation), or is expected to start.

The first year of operation for the net pen operation in Echo Bay was 1996.

1.14 Expected duration of program.

The program is on-going with no planned termination.

1.15 Watersheds targeted by program.

Lewis Subbasin/Lower Columbia Province

1.16 Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1 Brief Overview of Key Issues

Spring chinook are collected at Merwin Dam and are transported to Speelyai Hatchery where they are held until ripe, spawned, and incubated. After rearing at Speelyai Hatchery, they are trucked to the Echo net pens below Merwin Dam (rm 12.9) for acclimation and release. The purpose of this program is to spread out sport fishery effort. To monitor survival of this group, fish are differentially coded-wire-tagged from other hatchery releases.

1.16.2 Potential Alternatives to the Current Program

Alternative 1: Truck the smolts down to the forks and release below the rearing area of wild fall chinook and other ESA listed species. WDFW has determined that these fish out-migrate quickly and do not have a significant impact on ESA listed juveniles rearing in the NF Lewis River. Trucking of this stock would reduce survival and WDFW does not support this alternative.

1.16.3 Potential Reforms and Investments

Reform/Investment 1: Monitoring and evaluation of the interaction with listed species should be implemented $.

Section 2: Program Effects on ESA-Listed Salmonid Populations

2.1 List all ESA permits or authorizations in hand for the hatchery program.

Program is described in "Biological Assessment For The Operation Of Hatcheries Funded by The National Marine Fisheries Service (March 99)". By 2004 WDFW is writing HGMP's to cover all programs produced from and released at Lewis River, Merwin and Speelyai Hatcheries.

2.2.1 Descriptions, status and projected take actions and levels for ESA-listed natural populations in the target area.

The following ESA listed natural salmonid populations occur in the subbasin where the program fish are released:

ESA listed stock	Viability	Habitat
Spring Chinook-Hatchery	M	H
Fall Chinook Tule-Natural	L	M
Fall Chinook LRB-Natural	H	M
Late Winter Steelhead-Natural	M	M
Coho- Hatchery and Natural (Proposed)	Na	Na
H, M and L refer to high, medium and low ratings, low implying critical and high healthy.		

Identify the ESA-listed population(s) that will be directly affected by the program.
None.

Identify the ESA-listed population(s) that may be incidentally affected by the program.
Listed salmon and steelhead present in LCR include:
Lower Columbia River chinook salmon ESU (threatened effective May 24, 1999),
Lower Columbia River chum salmon ESU (threatened effective May 24, 1999),
Lower Columbia River steelhead ESU (threatened effective May 18, 1998).
Columbia Basin DPS Bull Trout (threatened on June 10, 1998).
Lower Columbia River Coho is currently a candidate for listing (proposed as threatened on June 14, 2004.)

2.2.2 Status of ESA-listed salmonid population(s) affected by the program.

Describe the status of the listed natural population (s) relative to "critical" and "viable" population thresholds.
Critical and Viable population thresholds have not been established for these ESUs and the populations within them. NOAA has formed a Lower Columbia River/Willamette River Technical Review Team to review population status within these ESU and develop critical and viable population thresholds.

Lower Columbia River spring chinook salmon *(Oncorhynchus tshawytsch*a)
At one time, an indigenous stock of spring chinook existed in the Lewis River, but with the construction of Merwin Dam (RM 19.5) in 1931, the majority of the spawning reaches became inaccessible and the stock subsequently declined. Early attempts to save the stock through hatchery production failed. By 1950, only a remnant population existed in the river, spawning primarily in the waters immediately below Merwin Dam and Cedar Creek. In 1971, managers

used the Carson Hatchery stock, which originated from Bonneville Dam fishway. These fish were reared and released from Speelyai Hatchery. Since then, releases have been made from both the Speelyai and the Lewis River hatcheries. The stocks used now include Cowlitz and Kalama, along with on-station returns to the Lewis River. The 1977 through 1987 average run size to the Lewis River was estimated at about 6,000 fish, with about 10 percent of the returns constituting jacks. Annual returns during this time period have ranged from about 2,300 adults in 1980 to nearly 17,000 adults in 1987. Although the spring chinook has a low contribution rate in terms of ocean harvest, returns do provide mainstem recreational fisheries and a popular sport fishery within the Lewis River. In river sport catch estimates during 1977 through 1987 have ranged from about 1,250 to nearly 10,000 adults, with an average annual catch of about 3,660 adults. In addition, number of jacks are also taken, a significant averaging about 400 per year, Natural escapement of adult fish, spawning ground counts, based on annual spawning have averaged about 1,400 adults, ranging from just over 300 to nearly 7,000 adults. The remainder of the fish return to the hatcheries, which suffer from poor returns due to low trapping efficiency.

Table 2 . Spring chinook salmon abundance estimates in the LCR (included hatchery and wild fish, FMEP 2003).

Year	Cowlitz	Kalama	Lewis	Wind
1990	320	34	1,419	173
1991	284	34	1,632	141
1992	279	168	1,328	248
1993	236	100	1,429	657
1994	167	408	478	50
1995	347	392	279	32
1996	36	272	504	425
1997	455	45	417	227
1998	356	46	213	60
1999	285	224	270	99
2000	266	34	439	216
2001	347	578	475	412
2002	Na	Na	Na	Na
2003	Na	Na	Na	Na

Lower Columbia River fall chinook salmon *(Oncorhynchus tshawytscha*) within the Evolutionary Significant Unit (ESU) are federally listed as "threatened" under the Endangered Species Act. . In Washington, the LCR chinook ESU includes all naturally spawned chinook populations from the mouth of the Columbia River to the Cascade Crest. As defined by harvest management units, there are four stocks of fall chinook that return to the Columbia River. These include the lower river hatchery (LRH), lower river wild (LRW), Bonneville Pool Hatchery (BPH) and the upriver brights (URB**).** The North Lewis wild fall chinook represent about 80 percent of the wild fall chinook returning to the lower Columbia River, (Norman, 1987). LRW fish also return to the East Fork Lewis. In addition, LRW fish are also found in the Cowlitz and Sandy rivers. Hatchery production of fall chinook has been inconsistent in terms of numbers and types of releases. Some release groups were for experimental rather than production purposes. After brood year 1985, no hatchery production has taken place. Current production is entirely natural. Natural spawning over the last 10 years has ranged from about 5,300 to 19,000 adults. Escapement estimates are based on peak fish counts, which are used as an index to estimate total spawners. The majority of the spawning takes place within the 4- mile stretch between the Lewis River Hatchery and Merwin Dam, in addition to Cedar Creek. Surveys are also conducted in the East Fork Lewis River within the 4.2-mile stretch from the area of Lewisville Park to Daybreak Park.

Table 3. Fall chinook salmon abundance estimates in the LCMA (FMEP 2003)

Year	Cowee-man River	Cowlitz River	Green River	Toutle River	Kalama River	EF Lewis River	NF Lewis River	Washougal River	Wind River Bright
1990	241	2,698	123		20,54	342	17,506	2,062	177
1991	174	2,567	123	33	5,085	230	9,066	3,494	269
1992	424	2,489	150		3,593	202	6,307	2,164	51
1993	327	2,218	281	3	1,941	156	7,025	3,836	686
1994	525	2,512	516	0	2,020	395	9,939	3,625	1,101
1995	774	2,231	375	30	3,044	200	9,718	2,969	278
1996	2,148	1,602	667	351	10,630	167	14,166	2,821	58
1997	1,328	2,710	560		3,539	307	8,670	4,529	220
1998	144	2,108	1,287	66	4,318	104	5,929	2,971	953
1999	93	997	678	42	2,617	217	3,184	3,105	46
2000	126	2,700	852	27	1,420	323	9,820	2,088	25
2001	646	5,013	4,951	132	3,714	530	15,000	3,901	217
2002	Na	Na	Na	Na	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na	Na	Na	Na	Na

Lower Columbia River steelhead *(Oncorhynchus mykiss*), were listed as threatened under the ESA on March 19, 1998. In Washington, the LCR steelhead ESU includes winter and summer steelhead in tributaries to the Columbia River between the Cowlitz River and Wind River. No total estimates of wild run size or escapement exist for either the North or East Fork Lewis River. Smoker et al. (1951) believed that combined winter and summer runs of native steelhead on the North Fork above Merwin Dam formerly exceeded 1,000 adults. Lucas (1985) determined that the wild component of winter steelhead at Lucia Falls averaged 56% (ranged 35-74 percent) of the creeled fish between 1973 and 1984. Specific age information for wild fish is limited. Of the 12 wild winter steelhead sampled from the 1977-1980 seasons in the North Fork fishery, 17 percent were l-ocean jacks and 83 percent were 2-ocean adults (Lavoy and Fenton 1983). In another study by the same authors, hatchery and wild fish were not separated; of 364 fish from the North Fork winter fishery, the largest group (63 percent) was 2- ocean fish with fork lengths that averaged between 67.1 cm and 71 cm. Three-ocean fish made up the next largest group (30 percent) and had average fork lengths of 80.1 cm to 84.2 cm. Only 2 percent of l-ocean fish were found, with fork lengths of 44 cm and 46 cm. Adult winter steelhead enter the basin from November through May with peak migration occurring in January and March for hatchery and wild fish, respectively. Spawning occurs from March through June in both the North and East forks (Howell et al. 1985). Lucas and Pointer (1987) found that peak spawning during the 1987 brood year in the East Fork occurred from mid-March through late April. McMillan (1985) suggests that spawning above Sunset Falls on the East Fork occurs over a short period of time in mid-March. Emergence occurs from April through July and the fish rear until spring a year later. Most wild North Fork smolts probably outmigrate in April and May at a size of 160 mm. The majority (83 percent) were found to have emigrated after two years, while about 17 percent emigrated after three years (Lavoy and Fenton 1983). East Fork stocks tend to follow the same time- frame, however no distribution of freshwater residency is available.

Table 4. Wild winter steelhead abundance estimates in the LCMA.

Brood Year	Index Redd Surveys					Pop. Est. Trap Counts		IndexTrap/redd
	Coweeman	SF Toutle	Green	EF Lewis	Washougal	NF Toutle	Kalama	Cedar Creek
1990	522	752	86	102		36	419	
1991		904	108	72	114	108	1,128	
1992		1,290	44	88	142	322	2,322	
1993	438	1,242	84	90	118	165	992	
1994	362	632	128	78	158	90	853	
1995	252	396	174	53	206	175	1,212	
1996	44	150				251	853	70
1997	108	388		192	92	183	537	78
1998	314	374	118	250	195	149	438	38
1999	126	562	72	276	294	129	562	52
2000	290	490	124	207	939	238	941	
2001	284	334	192	79	216	185	1085	
2002	Na	Na	Na	Na	Na	Na	Na	Na
2003	Na	Na	Na	Na	Na	Na	Na	Na

Columbia Basin DPS Bull Trout *(Salvelinus confluentus)* were listed as threatened on June 10, 1998 (63 FR 31647). The Columbia River Distinct Population Segment is threatened by habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, and past fisheries management practices such as the introduction of non-native species. The Lower Columbia Recovery Unit Team identified two core areas (Lewis and Klickitat rivers) within the recovery unit. Generally, in drainages colonized by anadromous salmon and steelhead, char successfully co-exist by occupying a different ecological niche. Coho smolt releases in the lower mainstem reaches of the Lewis River are believed to migrate quickly with low incidences of residuals and interaction with bull trout. The U.S. Fish and Wildlife Service recognized two sub-populations of bull trout in the Lewis River system: the Yale Reservoir Sub-Population and the Swift Reservoir Sub-Population (USDI 1998a and 1998b). Both sub-populations exhibit an adfluvial life history type. Adult fish reside in the reservoirs for the majority of the year and then migrate into the main river or its tributaries during late spring. Adult fish hold in their spawning tributaries throughout the early summer months, then spawn in August and September. After spawning, the adult fish return to the reservoirs until the following year's spawning season. Cougar Creek is the only tributary to Yale Reservoir where bull trout are known to spawn. The Yale Reservoir Sub-Population contains a low number of fish, coming dangerously close to extinction. PacifiCorp has been conducting bull trout spawner counts on Cougar Creek since 1978. The estimated Cougar Creek spawner population ranges from zero to 40 individuals (PacifiCorp and Cowlitz PUD 1999a, 100% Initial Information Package). Pine and Rush creeks are believed to be the principal spawning tributaries supporting the Swift Reservoir Sub-Population (Faler and Bair 1996). A cooperative monitoring effort began in the early 1990s on the Swift Reservoir Sub-Population. The primary cooperators include the Washington Department of Fish and Wildlife, PacifiCorp, and U.S. Forest Service. In the early 1990s, radio-tagging of adult bull trout was conducted to determine distribution of spawners. Beginning in 1994, population size estimates have been made on an annual basis using a visual mark-recapture method.

Lower Columbia River Coho (Oncorhynchus kisutch) is proposed as threatened on June 14, 2004.

Status: NMFS concludes that the LCR coho ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and

including the Big White Salmon and Hood Rivers. Twenty-one artificial propagation programs are considered to be part of the ESU as NMFS has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NMFS, 2004b). Coho historically spawned throughout the basin. Natural spawning is thought to occur in most areas accessible to coho; coho currently spawn in the North Lewis tributaries below Merwin Dam including Ross, Cedar, NF and SF Chelatchie, Johnson, and Colvin Creeks; Cedar Creek is the most utilized stream on the mainstem. Construction of Merwin Dam was completed in 1932; coho adults were trapped and passed above Merwin Dam from 1932-1957; the transportation of coho ended after the completion of Yale Dam (1953) and just prior to completion of Swift Dam (1959).

As part of the current hydro re-licensing process, reintroduction of coho into habitat upstream of the three dams (Merwin, Yale, and Swift) is being evaluated. Late stock coho (or Type N) were historically present in the Lewis basin with spawning occurring from late November into March. Early stock coho (or Type S) were historically present in the Lewis basin with spawning occurring from late October to November. Columbia River early and late stock coho produced at Washington hatcheries are genetically similar. Lewis River wild coho run is a fraction of its historical size. An escapement survey in the late 1930s observed 7,919 coho in the North Fork. In 1951, WDF estimated coho escapement to the basin was 10,000 fish in the North Fork (primarily early run). Escapement surveys from 1944-1999 on the North and South Fork Chelatchie, Johnson, and Cedar Creeks documented a range of 1-584 fish/mile. Currently, hatchery production accounts for most coho returning to the Lewis River. Natural coho production is presumed to be generally low in most tributaries. A smolt trap at lower Cedar Creek has shown recent year coho production to be fair to good in North and South forks of Chelatchie Creek (tributary of Cedar Creek) and in the mainstem Cedar Creek.

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

Hatchery activities are identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999).

Broodstock Program:

Broodstock Collection: Not applicable to this HGMP. See Lewis Spring Chinook HGMP.

Genetic introgression: Not applicable to this HGMP. See Lewis Spring Chinook HGMP

Rearing Program:

Operation of Hatchery Facilities: Net Pen operations impacts include water use from Merwin Lake and rearing effluent. Net Pen placement site and production limits fall with permitted and permit exempt limits (NPDES). Indirect take from this operation is unknown.

Disease: Outbreaks in the hatchery may cause significant adult, egg, or juvenile mortality. Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the programs at Lewis River Hatchery. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994) Chapter 5 have been instrumental in reducing disease outbreaks. Although pathogens occur in the wild and fish might be affected, they are believed to go undetected as predation quickly removes those fish. In addition, although pathogens may cause post release mortality in fish from hatcheries, there is little evidence that hatchery origin fish routinely infect natural populations of salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Stewart and Bjornn 1990; Foot et al. 2000). Prior to release, the health and condition of the coho population is established by the Area Fish

Health Specialist. This is commonly done 1-3 weeks pre-release but maybe up to 6 weeks at hatcheries with pathogen free water and little or no history of disease. Indirect take from disease effects is unknown.

Release:

Hatchery Production/Density-Dependent Effects: Hatcheries may release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time and can compete with listed fish. Spring Chinook releases are scheduled to start mid-March. Indirect take from density dependent effects is unknown.

Competition: Salmon and steelhead feed actively during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988) and if they do not migrate they can compete with wild fish. WDFW is unaware of any studies that have empirically estimated the competition risks to listed species posed by the program described in this HGMP. Studies conducted in other areas indicate that this program is likely to pose a minimal risk of competition:

1) As discussed above, coho salmon and steelhead released from hatchery programs as smolts typically migrate rapidly downstream. The SIWG (1984) concluded that "migrant fish will likely be present for too short a period to compete with resident salmonids." Studies have shown that coho moved downstream quickly, suggesting that coho spend little time in the river after release (Fuss and Byrne 1995). Coho smolts released from the Marblemount Hatchery on the Skagit River migrated approximately 11.2 river miles per day (Puget Sound data from Seiler et al. 1997; 2000). Fish released on-station into large river systems may travel even more rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1998). Snorkeling studies on the Elochoman River indicated few hatchery released chinook remaining after 2 weeks (Fuss 2000).
2) NMFS (2002) noted that "...where interspecific populations have evolved sympatrically, chinook salmon and steelhead have evolved slight differences in habitat use patterns that minimize their interactions with coho salmon (Nilsson 1967; Lister and Genoe 1970; Taylor 1991). Along with the habitat differences exhibited by coho and steelhead, they also show differences in foraging behavior. Peterson (1966) and Johnston (1967) reported that juvenile coho are surface oriented and feed primarily on drifting and flying insects, while steelhead are bottom oriented and feed largely on benthic invertebrates."
3) Flagg et al. (2000) concluded, "By definition, hatchery and wild salmonids will not compete unless they require the same limiting resource. Thus, the modern enhancement strategy of releasing salmon and steelhead trout as smolts markedly reduces the potential for hatchery and wild fish to compete for resources in the freshwater rearing environment. Miller (1953), Hochachka (1961), and Reimers (1963), among others, have noted that this potential for competition is further reduced by the fact that many hatchery salmonids have developed different habitat and dietary behavior than wild salmonids." Flagg et al (2000) also stated "It is unclear whether or not hatchery and wild chinook salmon utilize similar or different resources in the estuarine environment."
4) Fresh (1997) noted that "Few studies have clearly established the role of competition and predation in anadromous population declines, especially in marine habitats. A major reason for the uncertainty in the available data is the complexity and dynamic nature of competition and predation; a small change in one variable (e.g., prey size) significantly changes outcomes of competition and predation. In addition, large data gaps exist in our understanding of these interactions. For instance, evaluating the impact of introduced fishes is impossible because we do not know which nonnative fishes occur in many salmon-producing watersheds. Most available information is circumstantial. While such information can identify where inter- or intra specific relationships may occur, it does not

test mechanisms explaining why observed relations exist. Thus, competition and predation are usually one of several plausible hypotheses explaining observed results."

5) Studies from Fuss (2000) on the Elochoman River and Riley (2004) on two Willapa Bay tributaries (Nemah and Forks Creek), indicate that hatchery reared coho and chinook effectively leave the watersheds within days after release.

Predation (Freshwater): Spring chinook yearlings from this program may prey upon listed species of salmonids, but the magnitude of predation will depend upon the characteristic of the listed population of salmonids, the habitat in which the population occurs and the characteristics of the hatchery program (e.g.. release time, location, number released and size upon release). The site specific nature of predation and the limited number of empirical studies that have been conducted, make it difficult to predict the predation effects of this specific hatchery release.

WDFW is unaware of studies that have estimated the predation risks to listed fish posed by the Lewis River Hatchery spring chinook program. In the absence of site-specific empirical information, the identification of risk factors can be a useful tool for reviewing hatchery programs while monitoring and research programs are developed and implemented:

Predation Risk Factors:

Environmental Characteristics: These characteristics can influence the level of predation (see SIWG (1984) for a review) with risk greatest in small systems during periods of low flow and high clarity. The Lewis River watershed is a large system approximately 93 miles long, has a total fall of approximately 12,000 feet, and drains an area of about 1,050 square miles (EA Engineering 1999). The headwaters arise on the southern flanks of Mt. Saint Helens and Mt. Adams. The mainstem of the Lewis, also known as the North Fork, flows southwesterly from its source in Skamania County through three impoundments, Swift Reservoir (River Mile 47.9), Yale Reservoir (34.2), and Merwin Lake (RM 19.5). The middle and lower sections of the North Fork Lewis form the boundary between Clark and Cowlitz Counties. A major tributary, the East Fork Lewis River, enters the mainstem at RM 3.5. From this point the mainstem Lewis flows westerly, entering the Columbia River at RM 88. The average annual stream flow for the entire Lewis River system is approximately 6,125 cubic feet per second (cfs).

Dates of Releases: Spring chinook are released starting in February and March and the release takes place over one weeks time. In 2003, this date was March 6-13. The release date can influence the likelihood that listed species are encountered. There are limited studies on migration timing of naturally produced chinook but listed chinook from the Lower Columbia ESU are believed to emigrate over a wide window from March through August (LCFRB Technical Reports 2004).

Relative Body Size: Studies and opinions on size of predator/prey relationships vary greatly and although there is evidence that salmonids can prey upon fish up to 50% of their body length, most prey consumed is probably much smaller. Keeley and Grant (2001) suggest that the mean prey size for 100-200 mm fl salmonids is between 13-15% of predator body size. Salmonid predators were thought to be able to prey on fish up to approximately 1/3 of their length (USFWS 1994), although coho salmon have been observed to consume juvenile chinook salmon of up to 46% of their total length in aquarium environments (Pearsons et al. 1998). Artic char are well known as piscivorous predators, but recent studies suggest the maximum prey size is approximately 47% of their length (Finstad et al. 2002). The "33% of body length" criterion for evaluating the potential risk of predation in the natural environment has been used by NOAA Fisheries and the USFWS in a number of biological assessments and opinions (c.f., USFWS 1994; NMFS 2002). Although predation on larger chinook juveniles may occur under some conditions, WDFW believes that a careful review of the

Pearson and Fritts (1999) study supports the continued use of the "33% of body length criterion" for listed species until additional data for this system can be collected.

- Fork lengths of naturally produced chinook from the Lewis River system during the month of June indicate fish 48-55 mm fl (Columbia River Progress Report 2003-16). The Lewis River system fall chinook stock timing is the latest for the Columbia tributary stocks, and considered to be the worst case scenario (smaller size) when compared to other Columbia River systems.
- Abernathy Creek (WRIA 25) indicated lengths of 36mm – 40mm from March to April 1 (P. Hanratty, WDFW, pers comm. 2004). Growth for wild chinook from Abernathy Creek from the first of April to May 1 is unknown.
- Average fork lengths from 26 sampling sites on the Kalama River by week indicate fish 44 mm fl (April 25), 46 mm fl (May 3), 56 mm fl (May 11) and 62 mm fl (May 16). Other lengths thru August are available (Pettet WDFW 1990).
- Fork lengths from Cedar Creek (tributary to the N.F. Lewis River) indicate that average Chinook lengths reach approximately 50 mm fl between the weeks of April 12 and April 19, 2004, and are growing rapidly with fish 55-60 mm fl by April 26 and May 3, 2004.
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Release Location and Release Type: The likelihood of predation may also be affected by the location and the type of release. Other factors being equal, the risk of predation may increase with the length of time fish co-mingle. In the freshwater environment, this is likely to be affected by distribution of the listed species in the watershed, the location of the release and the speed at which fish released from the program migrate.

We have provided a summary of empirical information and a theoretical analysis of competition and predation interactions that may be relevant to the Lewis River spring chinook program.

Potential Echo Bay Spring Chinook predation and competition effects on listed salmonids: The proposed annual production goal for this program is up to 150,000 fish. Chinook are released in two groups. The first group of 75,000 is released in early February and the second group of 75,000 is released in early to mid-March. Spring chinook for both groups are at released at 10.0 FPP (155 mm fl). Surplus fish past these numbers would not be transferred to this pen site. Potential prey would be no greater than 51 mm in length (33% of 155). Hatchery migrants would encounter wild spring chinook fry and fingerlings. Due to size differences between yearling smolts and fingerlings, competition is probably low with first year chinook and steelhead with regards to food and spatial preference between species and size. Spring chinook fry emerge between November and March, depending on time of egg deposition and water temperature, and spend one full year in fresh water, and emigrate in their second spring as age-2 smolts. Falls chinook emergence is believed to start in late March or April, peeking in late April and early May, in the Lewis River. Outmigration continues to late summer. Impact to listed chinook is lessoned due to the downstream location of the Echo Bay Net Pen Complex (RM 10.0) which is below known chinook habitat in the North Fork and Cedar Creek.

Wild summer steelhead fry emerge from March through May; juveniles generally rear in fresh water for two years; emigration occurs from March to June, with peak migration from mid-April to mid-May. Winter steelhead spawning occurs from March to May with April 20th the peak week of spawning. Depending on available temperature units, eggs will hatch in 4-7 weeks with fry emergence approximately 2-3 weeks after hatching which indicates wild winter steelhead fry would not be available until late May to mid June (LCSI Draft

1998). Additional data are presented below:

Table 5. Steelhead Spawn and Emergence Windows.

Race	Spawn Time	Peak Spawn Window	Incubation to Hatch	Swim-up Window	Swim-up @ 50% Date	Source
Winter	March – May	April 15 - 25th	May 13 – June 15	May 27- July 7	June 17	LCSI Draft 1998
Summer	February – April	March 20- 30th.	April 14 – May 18	April 28 – June 2	May 15	Kalama River Research Report 2003

There is potential for predation by hatchery spring chinook on naturally produced coho.

Listed Coho (Proposed):
Current lengths and data for listed coho in the Lower Columbia ESU is unknown. Depending on water temperatures, hatchery coho fry during the month of April can range from 42 – 40 mm fl and be 50 mm fl by the first of May (Washougal Hatchery coho growth data 2004).Indirect take from competition or predation is unknown.

Residualism: To maximize smolting characteristics and minimize residualism, WDFW adheres to a combination of acclimation, volitional release strategies, size, and time guidelines.

- Condition factors, standard deviation and co-efficient of variation (CV) are measured through out the rearing cycle and at release.
- Feeding rates and regimes throughout the rearing cycle are programmed to satiation feeding to minimize out-of-size fish and programmed to produce smolt size fish at date of release.
- Based on past history, fish have reached a size and condition that indicates a smolted condition at release.
- Releases occur within known time periods of species emigration from acclimated ponds.
- Releases from these ponds are volitional with large proportions of the populations moving out initially with the remainder of the population vacating within days or a few weeks.
- Minimal residualism from WDFW chinook programs following these guidelines has been indicated from snorkeling studies on the Elochoman River (Fuss 2000) and on Nemah and Forks Ck. (Riley 2004). In extensive surveys conducted on the Lewis River, Hawkins and Tipping (1999) found no residualized hatchery spring chinook. Indirect take from residualism is unknown.

Migration Corridor/Ocean: It is unknown to what extent listed fish are available both behaviorally or spatially on the migration corridor. Once in the mainstem, Witty et al. (1995) has concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. There appear to be no studies demonstrating that large numbers of Columbia system smolts emigrating to the ocean affect the survival rates of juveniles in the ocean in part because of the dynamics of fish rearing conditions in the ocean. Indirect take in the migration corridor or ocean is unknown.

Monitoring:
Associated Monitoring Activities: The following monitoring activities are conducted in the Lower Columbia Management Area (LCMA) for adult steelhead and salmon: redd surveys are conducted for winter steelhead in the SF Toutle, Coweeman, EF Lewis and Washougal rivers.

Redd surveys are also conducted in the Cowlitz River for fall and spring chinook. Mark-recapture surveys provide data for summer steelhead populations in the Wind and Kalama rivers. Mark-recapture carcass surveys are conducted to estimate populations of chinook salmon in Grays, Elochoman, Coweeman, SF Toutle, Green, Kalama, NF Lewis, EF Lewis, rivers and Skamokawa, Mill, Abernathy, and Germany creeks and for all chum salmon populations. Snorkel surveys are conducted for summer steelhead in the EF Lewis, Washougal rivers. Adult trap Counts are conducted on the Cowlitz, NF Toutle, Kalama, and Wind rivers and on Cedar Creek a tributary of the NF Lewis River. Area-Under-the-Curve (AUC) surveys are conducted to collect population data for chum salmon in Grays River and Hardy and Hamilton Creeks. All sampling of carcasses and trapped fish include recovery of coded wide tagged (CWT) fish for hatchery or wild stock evaluation. Downstream migrant trapping occurs on the Cowlitz, Kalama, NF Lewis, and Wind rivers, Cedar Creek, and will expand to other basins as part of a salmonid life cycle monitoring program to estimate freshwater production and wild smolt to adult survival rates. Any take associated with monitoring activities is unknown but all follow scientific protocols designed to minimize impact.

Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

In other HGMPs provided to NOAA (Puget Sound, Upper Columbia), indirect takes from hatchery releases such as predation and competition is highly uncertain and dependant on a multitude of factors (i.e. data for population parameters - abundance, productivity and intra species competition) and although HGMPs discuss our current understanding of these effects, it is not feasible to determine indirect take (genetic introgression, density effects, disease, competition, predation) due to these activities. (No take tables are provided for this program).

Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Any additionally mortality from this operation on a yearly basis would be communicated to Fish Program staff for additional guidance.

Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

No data available.

Section 3: Relationship of Program to Other Management Objectives

3.1 Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the *NPPC Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

For ESU-wide hatchery plans, the production of spring chinook salmon from Lewis River Hatchery is consistent with:

- 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin
- 1999 Review of Artificial Production of Anadromous and Resident Fish in the Columbia River Basin
- Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1994)
- The *U.S. v. Oregon* Columbia River Fish Management Plan
- NWPPC Fish and Wildlife Program
- PacifiCorp Agreement

For statewide hatchery plan and policies, hatchery programs in the Columbia system adhere to a number of guidelines, policies and permit requirements in order to operate. These constraints are designed to limit adverse effects on cultured fish, wild fish and the environment that might result from hatchery practices. Following is a list of guidelines, policies and permit requirements that govern WDFW Columbia hatchery operations with which the production of spring chinook salmon from Lewis River Hatchery is consistent with the following WDFW Policies*:*

Genetic Manual and Guidelines for Pacific Salmon Hatcheries in Washington. These guidelines define practices that promote maintenance of genetic variability in propagated salmon.. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 5, IHOT 1995).

Spawning Guidelines for Washington Department of Fisheries Hatcheries. Assembled to complement the above genetics manual, these guidelines define spawning criteria to be use to maintain genetic variability within the hatchery populations.. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Genetic Policy Chapter 7, IHOT 1995).

Stock Transfer Guidelines. This document provides guidance in determining allowable stocks for release for each hatchery. It is designed to foster development of locally-adapted broodstock and to minimize changes in stock characteristics brought on by transfer of non-local salmonids (WDF 1991).

Fish Health Policy in the Columbia Basin. Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases within the Columbia Basin. Also, *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (Fish Policy Chapter 5, IHOT 1995).

National Pollutant Discharge Elimination System Permit Requirements This permit sets forth allowable discharge criteria for hatchery effluent and defines acceptable practices for hatchery operations to ensure that the quality of receiving waters and ecosystems associated with those waters are not impaired.

3.2 List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

For the operation of the Echo Bay Net Pens:

- Department of Natural Resources lease of State Aquatic Lands - Plan of Development, Operation and Maintenance required for the Speelyai Bay Net Pens
- Pollution Prevention Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and rearing national Pollutant Discharge Elimination System Waste Discharge General Permit.
- Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and rearing national Pollutant Discharge Elimination System Waste Discharge General Permit.

The program described in this HGMP is consistent with the following agreements and plans:

- Clark Public Utility Partnership (Vancouver Hatchery)
- The Columbia River Fish Management Plan
- *U.S. vs. Oregon* court decision
- Production Advisory Committee (PAC)
- Technical Advisory Committee (TAC)
- Integrated Hatchery Operations Team (IHOT) Operation Plan 1995 Volume III.
- Pacific Northwest Fish Health Protection Committee (PNFHPC)
- In-River Agreements: State, Federal, and Tribal representatives
- Northwest Power Planning Council Sub Basin Plans
- Washington Department of Fish and Wildlife Wild Salmonid Policy

3.3 Relationship to harvest objectives.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Total annual harvest is dependent on management response to annual abundance in PSC (U.S/Canada), PFMC (U.S. ocean), and Columbia River Compact forums. WDFW also has received authorization for tributary, Columbia River mainstem, and ocean fisheries; the combined harvest rates in the Fisheries Management and Evaluation Plan (FMEP), Columbia River Fish Management Plan (CRFMP), and ocean fisheries are reviewed annually in the North of Falcon process to ensure the harvest rates are consistent with recovery of the Lower Columbia river chinook populations.

The in-river sport fishery occurs from late February through July in the 17 miles from the mouth upstream to the deadline below Merwin Dam and is generally seven days per week. The harvest rate of the total adult return has averaged 60%. Maximum harvest rate for mainstem and in-river sport and commercial fisheries has averaged 72% (1980-1999). The in-river harvest rate on "natural" fish is very low (no unmarked chinook can be retained until August 1). Mainstem Columbia River Harvest of Lewis River spring chinook was very low after 1977 when April and May spring chinook seasons were eliminated to protect upper Columbia and Snake wild spring chinook. Mainstem Columbia harvest of Lewis River Hatchery spring chinook increased in 2001- 2002 when selective fisheries on adipose marked hatchery fish enabled mainstem spring fishing in April and May. Tributary harvest is managed to attain the Lewis River hatchery adult broodstock escapement goal. See Sec 1.12 above.

Brood Year	Smolt to Adult Survival (%)	Total Catch (all ages)
1995	0.04	45
1996	0.46	456
1997	0.25	308
1998	0.68	798
1999	nya	

3.4 Relationship to habitat protection and recovery strategies.

Merwin Hydroelectric Project – FERC:
Options for restoring and re-introduction of salmonid are being discussed with PacifiCorp. Along with current production levels for programs below Merwin Dam during the current re-licensing process.

Subbasin Planning and the Lower Columbia Fish Recovery Board (LCFRB):
The current Lewis System HGMP process is designed to deal with existing hatchery programs and potential reforms to those programs. A regional sub-basin planning process (Draft Lewis River Subbasin Summary May 17, 2002) is a broad-scale initiative that will provide building blocks of recovery plans by the Lower Columbia Fish Recovery Board (LCFRB) for listed fish. This group may well use HGMP alternative ideas on how to utilize hatchery programs to achieve objectives and harvest goals. In order to assess, identify and implement restoration, protection and recovery strategies, WDFW Region 5 staff is involved in fish and wildlife planning and technical assistance in concert with the LCFRB, including the role of fish release programs originating from Lewis River Hatchery.

Habitat Treatment and Protection:
WDFW is presently conducting, or has conducted, habitat inventories within the Lewis River. Ecosystem Diagnosis and Treatment (EDT) compares habitat today to that of the basin in a historically unmodified state. It creates a model to predict fish population outcomes based on habitat modifications. WDFW is also conducting a Salmon Steelhead Habitat Inventory Assessment Program (SSHIAP), which documents barriers to fish passage. WDFW's habitat program issues hydraulic permits for construction or modifications to streams and wetlands. This provides habitat protection to riparian areas and actual watercourses within the watershed.

Limiting Factors Analysis:
A WRIA 27 (Kalama, North Fork Lewis River, and East Fork Lewis River/Salmon Ck.) habitat limiting factors report (LFA) has been completed by the Washington State Conservation Commission (Wade G., March 2001) with the input of WDFW Region 5 staff.

3.5 Ecological interactions.

Below are discussions on both negative and positive impacts relative to the Lewis River spring chinook program and are taken from the Puget Sound listed and non-listed HGMP template (WDFW and NOAA 2003).

(1) Salmonid and non-salmonid fishes or species that could negatively impact the program: Lewis River spring chinook smolts can be preyed upon through the entire migration corridor from the river subbasin to the mainstem Columbia River and estuary. Northern pikeminnows and introduced spiny rays along the Columbia mainstem sloughs can predate on coho smolts as well

as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons. Mammals that can take a heavy toll on migrating smolts (river otters), and returning adults include: harbor seals, sea lions and Orcas.

(2) Salmonid and non-salmonid fishes or species that could be negatively impacted by the program: Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run Chinook salmon ESU (threatened); Snake River spring/summer-run Chinook salmon ESU (threatened); Lower Columbia River Chinook salmon ESU (threatened); Upper Columbia River spring-run Chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). Listed fish can be impacted thru a complex web of short and long term processes and over multiple time periods which makes evaluation of this a net effect difficult. WDFW is unaware of studies directly evaluating adverse ecological effects to listed salmon. See also Section 2.2.3 Predation and Competition.

3) Salmonid and non-salmonid fishes or other species that could positively impact the program. Multiple programs including spring chinook, Type S and Type N coho and steelhead programs are released in this system and limited natural production of chinook, coho, and steelhead occurs in this system along with numerous non-salmonid fishes (sculpins, lampreys and sucker etc.).

4) Salmonid and non-salmonid fishes or species that could be positively impacted by the program. A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Wild co-occurring salmonid populations might be benefited as hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Successful or non-successfully spawner adults originating from this program may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Carcasses from returning adult salmonids have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). The Lewis River drainage is thought to be inadequately seeded with anadromous fish carcasses can be used throughout the basin. Assuming integrated spawning and carcass seeding efforts, approximately 100 – 500 spring Chinook adult carcasses could contribute approximately 1,000 – 5,000 pounds of marine derived nutrients to organisms in the Lewis River. *Saprolegniasis* occurrences in young hatchery fish have been observed in greater frequency on Mitchell Act stations that have nutrient enhancement projects and in some cases, circumstantial evidence suggests more outbreaks of gill and tail fungus are the result of nutrient enhancement efforts. Staff is continuing to monitor observations or occurrences of this possibility.

Section 4. Water Source

4.1 Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile and natural limitations to production attributable to the water source.

For rearing at Merwin and Lewis River, water sources are Lewis River, Houghton Creek and Kenyon Creek. See Lewis River Spring Chinook HGMP.

The Echo Bay Net Pen site was sited to be out of the mainstem flow of the N.F.Lewis River at river mile 10.0 but also have a directional even flow through the complex. River flow is dominated by winter rains; though summer flow in the Lower North Fork is slightly augmented by glacier melt in the upper basin. The lower 11 miles of the Lewis River mainstem can be tidally influenced by the backwater of the Columbia. Mean annual streamflow for the entire Lewis River system is approximately 6,125 cubic feet per second (cfs). Average annual flow measured below Merwin Dam is 4,849 cfs with In 1995, Article 49 of the Merwin Dam licensing agreement amended to provide for increased minimum flows of 2,700 cfs during spring smolt migration in April, May, and June (WDFW 1998).

4.2 Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Potential Hazard	Risk Aversion Measures
Hatchery water withdrawal Screening Effluent Discharge	The Echo Bay Net Pen Facility has the following permits for operation: • SEPA checklist and Determination of Non-Significance (DNS) • Aquatics Resources Use Authorization No. 20-071210 • Cowlitz County Shoreline Substantial Development Permit • WDFW Hydraulic Project Permit The Echo Bay Net Pen Facility meets guidelines not requiring the following permits: • "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per month). • Army Corps of Engineers 404 Permit • DOE 401 Water Quality Permit

Section 5. Facilities

5.1 Broodstock collection facilities (or methods).

Broodstock collection not part of this HGMP, see Lewis River Spring Chinook HGMP.

5.2 Fish transportation equipment (description of pen, tank, truck, or container used).

Fish are transferred from Lewis Hatchery to the Echo Bay Net Pens by the following vehicles:

Equip. Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	1900	Y	N	90	Sodium Chloride (Salt)	5000 ppm (~0.5%)

5.3 Broodstock holding and spawning facilities.

Broodstock holding not part of this HGMP, see Lewis River Spring Chinook HGMP.

5.4 Incubation facilities.

Incubation facilities not part of this HGMP, see Lewis River Spring Chinook HGMP.

5.5 Rearing facilities.

see Lewis River Spring Chinook HGMP.

Fish are reared in those receptacles until transfer at the end of March to the Echo Bay Net Pens.

5.6 Acclimation/release facilities.

Six net pens (dimensions 20'X20'X10') provide 4000 cubic feet of rearing each. One larger net pen (dimensions 12'X60'X10') provides 8640 cubic feet of rearing. Configuration for the pen complex is two rows of three 20'X20' pens in line. The larger pen straddles one row of three pens. A system of walkways (3' wide), surround all the pens and are constructed on the complex frame. The pens are securely anchored in Echo Bay by stone anchors. Spring Chinook are acclimated and released in 2 phases:
Phase 1: 75,000 fish are transferred in December and released at the end of January/early February after approximately 40-45 days of acclimation and growth.
Phase 2: 75,000 fish are transferred in early February and released by mid-March after approximately 40-45 days of acclimation and growth.
Phase 3: After the Chinook releases, 50,000 summer steelhead are transferred to the pens for acclimation and rearing until May 1st.

5.7 Describe operational difficulties or disasters that led to significant fish mortality.

Severe flooding conditions in 1996 led to the program termination and early release.

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

For equipment or operational net pen problems, the pens operate under an Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and Rearing National Pollutant Discharge Elimination System Waste Discharge General Permit. During storm water events, increased monitoring of the net pen program and communication with Lewis Hatchery Complex staff is conducted with contingency plans prepared. Fish health is monitored by staff and any problems are quickly communicated if observed.

Section 6. Broodstock Origin and Identity

6.1 Source.

See Lewis River Spring Chinook HGMP.

6.2.1 History.

See Lewis River Spring Chinook HGMP.

6.2.2 Annual size.

See Lewis River Spring Chinook HGMP.

6.2.3 Past and proposed level of natural fish in the broodstock.

See Lewis River Spring Chinook HGMP.

6.2.4 Genetic or ecological differences.

See Lewis River Spring Chinook HGMP.

6.2.5 Reasons for choosing.

The stock has a run entry pattern and timing that provides harvest opportunities for fisheries in the Lewis River subbasin, the lower Columbia mainstem/tributaries, Washington/Oregon Coast. The present naturally spawning spring chinook population in the Lewis River is composed primarily of hatchery returns, and as a result, most naturally spawning chinook are likely hatchery strays (WDFW SaSI 2002).

6.3 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

Broodstock selection not part of this HGMP. See Lewis River Spring Chinook HGMP.

Section 7. Broodstock Collection

7.1 Life-history stage to be collected (adults, eggs, or juveniles).

Not applicable, see Lewis River Spring Chinook HGMP.

7.2 Collection or sampling design

Not applicable, see Lewis River Spring Chinook HGMP.

7.3 Identity.

Not applicable, see Lewis River Spring Chinook HGMP.

7.4 Proposed number to be collected:

7.4.1 Program goal (assuming 1:1 sex ratio for adults):

Not applicable, see Lewis River Spring Chinook HGMP.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1990-2001), or for most recent years available.

Not applicable, see Lewis River Spring Chinook HGMP.

7.5 Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Not applicable, see Lewis River Spring Chinook HGMP.

7.6 Fish transportation and holding methods.

Not applicable, see Lewis River Spring Chinook HGMP.

7.7 Describe fish health maintenance and sanitation procedures applied.

Not applicable, see Lewis River Spring Chinook HGMP.

7.8 Disposition of carcasses.

Not applicable, see Lewis River Spring Chinook HGMP.

7.9 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Not applicable, see Lewis River Spring Chinook HGMP.

Section 8. Mating

8.1 Selection method.

Not applicable, see Lewis River Spring Chinook HGMP.

8.2 Males.

Not applicable, see Lewis River Spring Chinook HGMP.

8.3 Fertilization.

Not applicable, see Lewis River Spring Chinook HGMP.

8.4 Cryopreserved gametes.

Not applicable, see Lewis River Spring Chinook HGMP.

8.5 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Not applicable, see Lewis River Spring Chinook HGMP.

Section 9. Incubation and Rearing.

9.1.1 Number of eggs taken and survival rates to eye-up and/or ponding.

Not applicable, see Lewis River Spring Chinook HGMP.

9.1.2 Cause for, and disposition of surplus egg takes.

Not applicable, see Lewis River Spring Chinook HGMP.

9.1.3 Loading densities applied during incubation.

Not applicable, see Lewis River Spring Chinook HGMP.

9.1.4 Incubation conditions.

Not applicable, see Lewis River Spring Chinook HGMP.

9.1.5 Ponding.

Not applicable, see Lewis River Spring Chinook HGMP.

9.1.6 Fish health maintenance and monitoring.

Fish First staff conducts work at the net pens 3-7 days weekly. Observations and weekly progress is communicated to Lewis River Hatchery Complex staff. Loss rate above normal < 1 fish per day (0.02) or problems are reported immediately. The hatchery staff would communicate with the area fish health specialist to schedule a visit. By the time fish are at a larger size, health problems have been generally minor.

9.1.7 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Not applicable, see Lewis River Spring Chinook HGMP.

9.2.1 Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1990-2001), or for years dependable data are available.

Table below indicates survival from egg to smolts at Lewis Hatchery.

Year	Egg Take	Green-Eyed Survival (%)	Eyed-Ponding Survival (%)	Fry-fingerling Survival (%)	Fingerling-Smolt Survival (%)
1992	757200	U	U	98.9	97.50
1993	1543600	U	U	98.00	99.20
1994	1563300	95.20	96.50	91.40	95.60
1995	1522000	96.14	99.73	97.30	98.60
1996	1612000	95.38	99.43	96.50	93.70
1997	1696000	91.37	99.69	87.80	95.70
1998	1990000	93.58	99.68	95.70	82.70
1999	1460000	94.21	99.60	98.40	98.50
2000	1579630	97.04	99.56	96.10	96.60
2001	1373232	95.70	98.90	97.96	nya

9.2.2 Density and loading criteria (goals and actual levels).

For the Echo Bay Net Pen densities, steelhead poundage is programmed to not exceed 0.50 lbs/per cubic ft. At 7,500 smolts per net pen, actual maximum loadings are 0.375 lbs per cubic ft.

9.2.3 Fish rearing conditions.

Environmental parameters: water temperatures and dissolved oxygen are monitored on a routine basis thru the rearing period. Net pen covers are used to prevent avian predation during the rearing period. Demand feeders are used for feeding.

9.2.4 Indicate biweekly or monthly fish growth information (average program performance), including length, weight, and condition factor data collected during rearing, if available.

Table below indicates growth data at Lewis Hatchery.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate	Hepatosomatic Index	Body Moisture Content
04/02/01	84.4	89.0	U	nya	nya	nya
05/26/01	U	54.6	U	0.364	nya	nya
06/32/01	102.8	44.1	1.035	0.192	nya	nya
07/21/01	U	37.1	U	0.159	nya	nya
08/18/01	U	32.4	1.130	0.127	nya	nya
09/22/01	116.4	22.6	U	0.303	nya	nya
10/27/01	U	17.4	U	0.230	nya	nya
11/24/01	U	14.0	1.189	0.195	nya	nya
12/22/01	150.3	12.1	U	0.136	nya	nya
01/19/02	U	10.4	1.206	0.141	nya	nya
02/23/02	184.0	8.61	1.188	0.172	nya	nya
03/23/01	U	7.7	U	0.106	nya	nya

9.2.5 Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Same as above, see section 9.2.4.

9.2.6 Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. Fed Per gpm of Inflow	Food Conversion During Period
12-Release	Trout AB 2.5	Demand Feeders	> 1.0% daily	Not applicable	>1.5:1.0

9.2.7 Fish health monitoring, disease treatment, and sanitation procedures.

Fish First staff conducts work at the net pens 3-7 days weekly. Observations and weekly progress is communicated to Lewis River Hatchery staff. Loss rate above normal < 1 fish per day (0.02) or problems are reported immediately. The hatchery staff would communicate with the area fish health specialist to schedule a visit. By the time fish are at a larger size, health problems have been generally minor. After release, net pens are removed from the water, dried and broom cleaned at the hatchery grounds and stored.

9.2.8 Smolt development indices (e.g. gill ATPase activity), if applicable.

Besides time, size and condition factors, staff can observe aggressive swarming against net pen sides. During final length frequency and weight sampling, staff can observe smolt and parr appearance ratios. Loose scales during feeding events are early signs of smolt development. From past history, hatchery specialists will reduce feed regimes in early spring as fish show signs of smolting. Also at this time feed conversions fall and fish appear leaner with condition factors falling well below 1.0 (K) to .90 (K). Staff can observe smolt ratios during final length frequency measurements upon release. Any observations of non-smolted fish are communicated to Lewis River Hatchery Complex staff. ATPase activity is not measured.

9.2.9 Indicate the use of "natural" rearing methods as applied in the program.

Although not a direct natural rearing method, net pen culture exposes fish to increased natural conditions that hatchery concrete raceways or release ponds may not provide. Net pens placed in river, lake or reservoir settings can serve to acclimate fish to some environmental and behavioral natural conditions. Terrestrial and invertebrate food items originating from the natural environment are beneficial to fish as supplemental food sources. During rearing, the Echo Bay Net Pens can be subjected to random predation attempts that can ultimately benefit their survival. This occurs when avian predators such as herons and kingfishers will perch on net pen covers and pen walkways and try to spear potential prey within the pen. Mammals (mink, river otters) will investigate the net pen site to try and catch fish.

9.2.10 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

- Protocols for population size, fish health disinfection and genetic guidelines followed.
- Staff is available to respond to emergencies.
- IHOT guidelines are followed for rearing, release and fish health parameters.

Section 10. Release

10.1 Proposed fish release levels.

150,000 smolts at 10.0 FPP from the Echo Bay Net Pens.

10.2 Specific location(s) of proposed release(s).

Programs are released at the Echo Bay Net Pens located on the North Fork Lewis River at RKm 16.1.

10.3 Actual numbers and sizes of fish released by age class through the program.

YEAR	Number	Months Released	Size
1996	38,000	Feb.	10/FPP
1997	151,177	Feb/Mar	10.0 FPP
1998	144,400	Feb/Mar	10.0 FPP
1999	127,590	Feb/Mar	10.0 FPP
2000	147,560	Feb/Mar	10.0 FPP
2001	137,341	Feb/Mar	10.0 FPP
2002	148,909	Jan/Mar	10.0 FPP
2003	149,249	Feb/Mar	10.0 FPP
2004	150,688	Jan/Mar	10.0 FPP

10.4 Actual dates of release and description of release protocols.

Over the years, the first group has been released from February 1- 27. The second group has been released from March 1st – March 20. To release the net pens, staff lowers the sides from the hand railing to allow the nets to drop below the surface. Fish swim out from the pens during this time. After release net pens are pulled from the water and loaded onto boats and taken ashore for cleaning.

10.5 Fish transportation procedures, if applicable.

Transportation is not used for release.

10.6 Acclimation procedures (*methods applied and length of time*).

Spring chinook are acclimated and released in 2 phases:
Phase 1: 75,000 fish are transferred in December and released early February after approximately 40-45 days of acclimation and growth.
Phase 2: 75,000 fish are transferred in early February and released by mid-March after approximately 40-45 days of acclimation and growth.

10.7 Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

100% AD clipped selective mark is done at Lewis Hatchery before transfer to the net pens. CWTs have been applied periodically.

10.8 Disposition plans for fish identified at the time of release as surplus to programmed or approved levels

Fish above the program level are not transferred to the Echo bay Net Pens.

10.9 Fish health certification procedures applied pre-release.

Prior to release, the population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release. Prior to this examine, whenever abnormal behavior or mortality is observed, staff also contacts the Area Fish Health Specialist.

Reporting and control of selected fish pathogens are done in accordance with the Co-managers Fish Disease Control Policy and IHOT guidelines.

10.10 Emergency release procedures in response to flooding or water system failure.

Complex manager would contact and inform regional management of the situation. Policy would generally be to retain fish at the site. There is an Emergency Response Plan pursuant to section S6.A-J of the Upland Fin-fish Hatching and rearing national Pollutant Discharge Elimination System Waste Discharge General Permit that outlines contingency plans in case of emergencies.

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Region staff can forego acclimation rearing at Echo Bay Net Pens for management or fish health issues and release the program directly into the N.F. Lewis.

- The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal rearing of delay in the rivers, limiting interactions with naturally produced steelhead juveniles.
- WDFW uses acclimation and release of chinook smolts in lower river reaches where possible. This program is in an area below wild fish spawning and rearing habitat.
- Release is in late winter and early spring which is in advance of emerging and emigrating listed fish.
- WDFW proposes to continue monitoring, research and reporting of hatchery smolt migration performance behavior, and intra and interspecific interactions with wild fish to access, and adjust if necessary, hatchery production and release strategies to minimize effects on wild fish.

Section 11. Monitoring and Evaluation of Performance Indicators

11.1.1 Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Performance indicators for the hatchery program includes broodstock escapement and associated egg take, rearing and release data. Performance indicators for fisheries typically include estimates for the catch, catch rates, harvest, harvest rates, hooking mortality for fish caught and released, effort of the fishery, and catch per unit effort (CPUE) for the fishery. WDFW makes statistically based estimates of hatchery steelhead and salmon catch from the WDFW catch record card (CRC) and follow-up phone surveys. In conjunction with CRC estimates, these can be used to determine the hatchery harvest rate, interception rate for wild fish, and catch per unit effort (CPUE). Chinook and coho fisheries in major tributaries including the Grays, Elochoman, Cowlitz, Toutle, Kalama, Lewis, Washougal, Wind, and Little White Salmon Rivers are sampled to collect CWT, CPUE, and interception rate for wild fish.

To evaluate hatchery programs comprehensive monitoring and evaluation programs are needed. These programs at a minimum must measure adult hatchery and wild escapement, and fishery contributions from hatchery and wild salmonids for every stock. Reproductive success should be measured for representative wild and hatchery stocks. Ecological interactions (predation, competition, and disease) need to be measured for representative stocks as well. See section 1.10.

11.1.2 Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Chinook abundance data for streams will continue with PSMFC funding. Intermittent chum surveys will continue if outside funding secured. Baseline stream surveys should be continued for wild spawning. Staffing hours to conduct spawning grounds surveys and biological assessment is limited by funding. Funding and resources are currently committed to monitor and evaluate this program as detailed in the Lower Columbia River FMEP (2002).

11.2 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Monitoring, evaluation and research follow scientific protocols with adaptive management process if needed. WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities. Most trap mortalities are the result of extreme environmental conditions that flood traps or equipment failure. WDFW will take precautions to make sure the equipment is properly functioning during the season. If environmental conditions are forecast that will cause high mortality then traps will be removed or opened up to allow unobstructed passage without mortality. Any take associated with monitoring activities is unknown but all follow scientific protocols and “Best Practices” designed to minimize impact.

Section 12. Research

12.1 Objective or purpose.

No research is directly associated with the program. Results from research on Kalama River wild and hatchery steelhead and steelhead and studies on the Lewis River (Merwin hatchery) will be used for future management of steelhead programs in Region 5 programs. See Kalama River steelhead HGMPs and Merwin Hatchery steelhead HGMPs.

12.2 Cooperating and funding agencies.

NA

12.3 Principle investigator or project supervisor and staff.

NA

12.4 Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.

NA

12.5 Techniques: include capture methods, drugs, samples collected, tags applied.

NA

12.6 Dates or time periods in which research activity occurs.

NA

12.7 Care and maintenance of live fish or eggs, holding duration, transport methods.

NA

12.8 Expected type and effects of take and potential for injury or mortality.

12.9 Level of take of listed fish: number of range or fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

NA

12.10 Alternative methods to achieve project objects.

NA

12.11 List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

NA

12.12 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury or mortality to listed fish as a result of the proposed research activities.

NA

Section 13. Attachments and Citations

13.1 Attachments and Citations

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Section 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

14.1 Certification Language and Signature of Responsible Party

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____